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Frequency and Effects of Great Trochanteric Pain Syndrome in Patients with Chronic Low Back Pain: A Cross-Sectional Study

Kronik Bel Ağrılı Hastalarda Büyük Trokanterik Ağrı Sendromunun Sıklığı ve Etkileri: Kesitsel Çalışma

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ABSTRACT Objective: Greater trochanteric pain syndrome (GTPS) can be commonly seen in patients with low back, hip, or knee pain. The aims of the study are to determine the frequency of GTPS in patients with chronic low back pain (CLBP), to reveal the clinical effects of GTPS and to identify the risk factors for the development of GTPS. **Material and Methods:** Patients with CLBP were evaluated with standardized history and physical examination. Oswestry Disability Index (ODI) and Short Form-36 (SF-36) were used for the asessment of quality of life. Patients were assessed with lumbar anteroposterior, lumbar lateral radiographs, and lumbar magnetic resonance imaging. **Results:** GTPS was detected in 59.2% of patients with CLBP. The presence of GTPS increased the pain level measured by visual analog scale, it worsens the functional status measured by ODI (p=0.007, p=0.001). Presence of GTPS caused deterioration in SF-36 pain subparameter (p=0.005). While female gender was found to be a risk factor (p=0.031), gait disturbance and neurogenic claudication were found to be more common in patients with GTPS (p=0.021, p=0.017). Osteophytes, sclerosis, loss of intervertebral disc space, and central spinal stenosis were common in patients with GTPS (p=0.021, p=0.011, p=0.05, p=0.021). **Conclusion:** GTPS was a very common and painful condition in patients with CLBP. It was seen more frequently in women, in patients with a more severe degenerative condition, and with central spinal stenosis. GTPS increased the level of pain and negatively affects the quality of life.

Keywords: Greater trochanteric pain syndrome; chronic low back pain; quality of life

ÖZET Amaç: Büyük trokanterik ağrı sendromu (BTAS), bel, kalça ve diz hastalıklarında da sık görülmektedir. Çalışmanın amacı, kronik bel ağrılı (KBA) hastalarda BTAS sıklığını saptamak, BTAS'nin klinik etkilerini ortaya koymak ve BTAS gelişimine etki eden faktörleri belirlemektir. **Gereç ve Yöntemler:** KBA ile başvuran hastalar standardize edilmiş öykü ve fizik muayene ile değerlendirilmelerinin ardından lomber ön-arka, lomber yan grafiler ve lomber manyetik rezonans görüntülemeleri ile değerlendirildi. Tüm hastalara Oswestry Dizabilite Anketi (ODA), Kısa Form-36 [Short Form-36 (SF-36)] dolduruldu. **Bulgular:** KBA hastalarda %59,2 oranında BTAS saptanmıştır. BTAS varlığı görsel analog skala ile ölçülen ağrı düzeyini artırmakta iken OBA ile ölçülen fonksiyonel durumu kötüleştirmektedir (p=0,007, p=0,001). BTAS varlığı SF-36 ağrı alt parametresinde bozulmaya neden olmaktadır (p=0,005). Kadın cinsiyet bir risk faktörü olarak saptanırken (p=0,031), BTAS'li hastalarda yürüme bozukluğu ve nörojenik kladikasyon daha fazla bulunmuştur (p=0,021, p=0,017). BTAS hastalarında osteofit, skleroz, intervertebral disk mesafesi kaybı ve santral spinal dar kanal daha sıktır (p=0,021, p=0,011, p=0,05, p=0,021) **Sonuç:** KBA'lı hastalarda BTAS oldukça sık rastlanan, ağrılı bir durumdur. Kadınlarda, dejeneratif durumun daha ağır olduğu hastalarda ve santral spinal dar kanalı olan hastalarda daha sık görülebilmektedir. Ağrı düzeyini artırmakta ve yaşam kalitesini olumsuz etkilemektedir.

Anahtar Kelimeler: Büyük trokanterik ağrı sendromu; kronik bel ağrısı; yaşam kalitesi

Low back pain (LBP) is a major musculoskeletal problem that causes functional limitations and suboptimal quality of life. According to a meta-analysis conducted in 2022, the prevalence of chronic LBP (CLBP) has been reported as 20.6% to 36.1% in older adults.[1] The guidelines about management of CLBP commonly point that a careful history, physical and neurological examination should be essential for di-

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agnosis. However none of the guidelines have described preferred/recommended clinical examination. On the other hand in clinical practice, the patients with CLBP have multisite pain including, hip, knee and back pain. Accompanying LBP with pain in another site complicates both diagnosis and treatment. It is well known that patients with CLBP can experience lateral hip pain frequently.[2]

Greater trochanteric pain syndrome (GTPS) is an important and frequent cause of lateral hip pain.[3] While the syndrome was previously called trochanteric bursitis because the pain is often associated with peritrochanteric bursa inflammation, it has been renamed as GTPS in recent years due to the fact that the pathologies of the gluteus medius and minimus tendons are more common causes of pain. The studies with magnetic resonance imaging (MRI) have also reported that the problem is tendinopathy rather than trochanteric bursa inflammation.[4] Studies with ultrasonography also confirmed that bursa inflammation was seen in only 20.2% of patients, 49.9% had gluteal tendinosis, and 28.5% had iliotibial band thickening.[5] On the other hand, the contribution of imaging methods in establishing the primary diagnosis is limited and the diagnosis is mostly made by clinical findings. The contribution of imaging methods is rather that it provides differential diagnosis.[6]

Although GTPS can be seen alone, it is mostly seen secondary to hip, knee, and spine pathologies as a result of biomechanical changes caused by diseases in these regions. According to the literature, it can be seen in 20-50% of patients followed up with LBP.[7-9] Similarly, it is reported that the incidence in patients with femoroacetabular impingement syndrome is 39.2% and 25% in patients with symptomatic knee osteoarthritis.[10,11] The studies also pointed out that GTPS is a usually missed diagnosis. Moreover, there is a lack of scientific data about the effect of GTPS on pain and functional status in patients with CLBP. Additionally, the associations with radiological and clinical findings with GTPS are not well defined in patients with CLBP.

In this study, our primary aims are to find the rate of GTPS in patients with CLBP in an outpatient setting and compare the functional status of the patients with GTPS to patients with CLBP. Secondary aims of the study are to determine clinical and radiological factors for the development of GTPS.

MATERIAL AND METHODS

PARTICIPANTS

Patients in the 40-80 age group who were referred to physical and rehabilitation medicine (PRM) outpatient clinics with LBP for at least 6 months were enrolled in the study. In order to conduct the study with homogenous patient population, patients who had previous hip or low back surgery, history of vertebral fracture, spondyloarthropathy and diseases such as fibromyalgia that would cause chronic widespread pain were excluded from the study. The first evaluation of the patients was made by a PRM specialist. According to the standardized evaluation method, a GTPS criterion was an increase in pain and tenderness in the greater trochanter with manual palpation. Increased pain during active abduction and passive adduction, and pain when lying on the painful side during sleep were considered additional findings.[12,13] Demographic data, the duration of LBP (months), previous treatments, and comorbidities were noted.

MEASURES

Functional status was evaluated with the Oswestry Disability Index (ODI) and Short Form 36 (SF-36).

ODI, was developed to assess pain-related disability in people with acute, subacute, or CLBP. ODI includes 1 item related to pain and 9 items related to activities of daily living (personal care, lifting, walking, sitting, standing, sleep, sexual life, social life, and travel). Each item is measured on a 6-point rank scale ranging from best to the worst case scenario. The scoring for each item gradually increases by 1 for each response option, from 0 (first answer option) to 5 (last answer option). Missing values are skipped. The percentage value is calculated for the total score. The total highest score is 50; the percentage value is between 0-100. Turkish validation was performed by Yakut et al.[14,15]

SF-36; In the 36-item questionnaire, the fourth and fifth items are evaluated as yes/no, while the other items are Likert type (three and six points). The

scale evaluates the last 4 weeks and consists of eight sub-parameters. These parameters are physical functioning (10 items), role limitations due to physical health (4 items), role limitations due to emotional problems (3 items), energy-vitality (4 items), emotional well-being (5 items), social functioning (2 items), pain (2 items) and general health (5 items). A score between 0 and 100 is taken for each item, Lower scores indicate the state of worsening, and scores that increase towards 100 represent the state of well-being. The Turkish validity and reliability of the questionnaire, which is not specific to any age, disease group, or treatment type, were determined by Koçyiğit et al.[16]

A second clinician who was masked to the clinical asessment evaluated the lumbar anteroposterior and lateral radiographs of the patients. In this assessment a) Osteophytes in the lumbar spine, b) Loss of height in the vertebral body, c) Decreased disc distance, d) The presence of increased sclerosis in the joints of the lumbar region have been noted. In the lumbar MRI of the patients; disc degeneration, Modic changes, disc herniation, facet joint hypertrophy, lateral canal stenosis, and spinal canal stenosis were evaluated.

STATISTICAL ANALYSIS

IBM SPSS Statistics v.25 program was used for statistical analysis. Percentage, mean, median, and standard deviation values were obtained using descriptive statistical methods. The suitability of the data to the normal distribution was evaluated with the Kolmogorov-Smirnov test. The Pearson chi-square test was used to compare categorical data. Variables with normal distribution from quantitative data were evaluated with the Student's t-test, while variables that did not comply with the normal distribution were evaluated with the Mann-Whitney U test.

ETHICAL APPROVAL

This cross-sectional observational study was conducted in accordance with Declaration of Helsinki and approved by the İstanbul Medeniyet University Göztepe Training and Research Hospital Clinical Research Ethics Committee on February 5, 2020 (no: 2020/0018). Written informed consent was obtained from all patients.

RESULTS

One hundred and fifty six patients who applied with the complaint of CLBP were included in the study, 52 patients who did not meet the study criteria were excluded from the study. Six patients did not want to participate in the study and the study was completed with 98 patients. The presence of GTPS was detected in 58/98 (59.2%) patients. Demographic and clinical characteristics of patients with and without GTPS are summarized in Table 1, Table 2, and Table 3.

The incidence of GTPS was found to be increased in women (p=0.03). While the mean age of the GTPS group was higher than the CLBP group, this was not statistically significant (p=0.56). There was no difference between the groups for parameters such as body mass index, concomitant disease, and smoking (p=0.414, p=0.276, p=0.442, respectively).

While the pain levels of the GTPS group evaluated by the visual analog scale were significantly higher (p=0.007), the duration of pain was similar for

TABLE 1: Quantitative demographic and clinical characteristics.

	Group	Number	Mean	SD	p value
Age	CLBP	40	48.1000	8.30446	0.055
	CLBP+GTPS	58	51.5345	8.81429	
Body mass index	CLBP	40	27.6242	3.83887	0.327
	CLBP+GTPS	58	95.3794	521.71124	
Pain duration (month)	CLBP	40	56.0000	36.00855	0.276
	CLBP+GTPS	58	88.8276	223.03930	

SD: Standard deviation; CLBP: Chronic low back pain; GTPS: Greater trochanteric pain syndrome.

TABLE 2: Quantitative pain and functional assessment parameters.

	Group	Number	Mean	SD	p value
VAS (cm)	CLBP	40	6.0750	1.38467	0.007
	CLBP+GTPS	58	6.8793	1.43976	
ODI	CLBP	40	52.7000	18.53922	0.001
	CLBP+GTPS	58	70.7241	14.21488	
SF-36 physical functioning	CLBP	40	61.5000	15.61557	0.406
	CLBP+GTPS	58	58.8276	15.50567	
SF-36 role limitations due to physical health	CLBP	40	23.1250	27.95802	0.335
	CLBP+GTPS	58	17.6724	26.49422	
SF-36 role limitations due to emotional problems	CLBP	40	36.7000	78.31468	0.099
	CLBP+GTPS	58	14.9362	28.76055	
SF-36 energy	CLBP	40	54.5000	16.90092	0.570
	CLBP+GTPS	58	56.5517	17.94746	
SF-36 emotional well-being	CLBP	40	60.0000	17.77350	0.416
	CLBP+GTPS	58	62.8103	16.01694	
SF-36 social functioning	CLBP	40	53.5750	17.67642	0.2
	CLBP+GTPS	58	57.5517	12.88672	
SF-36 pain	CLBP	40	49.8000	11.18882	0.005
	CLBP+GTPS	58	43.3621	10.81535	
SF-36 general health	CLBP	40	54.8750	14.47755	0.765
	CLBP+GTPS	58	55.7759	14.86199	

SD: Standard deviation; VAS: Visual analog scale; CLBP: Chronic low back pain; GTPS: Greater trochanteric pain syndrome; ODI: Oswestry Disability Index; SF-36: Short Form 36.

both groups (p=0.276). Among functional evaluations, ODI scores were higher in the GTPS group (p=0.001), while the SF-36 pain sub-parameter was found to be significantly lower (p=0.005). Other SF-36 subparameters were similar.

Clinically, the radiation of pain to the hip was statistically higher in GTPS patients (p=0.007), and patients described more neurogenic claudication (p=0.017). Another examination finding more frequently observed in the GTPS group was gait disturbance (p=0.021). There was no difference in the parameters of sagittal spine misalignment, lumbar paravertebral muscle spasm, straight leg lift test, femoral stretch test, muscle strength evaluation, deep tendon reflex abnormality, presence of pathological reflex, leg length inequality, hamstring shortness, sensory defect, which are other clinical evaluation findings (respectively; p=0.133, p=0.536, p=0.532, p=0.347, p=0.491, p=0.603, p=0652, p=0.401, p=0.403).

For radiological evaluations; the presence of osteophytes, loss of intervertebral disc distance, and increased sclerosis were found to be significantly higher in the GTPS group on direct radiographs (respectively; p=0.021, p=0.05 p=0.014). Since osteoporotic patients with vertebral height loss were excluded from the study, there was no such patient in the study population. On MRI, while central spinal stenosis was more common in GTPS patients (p=0.021), disc degeneration, disc herniation, Modic changes, and lateral spinal stenosis were similar in both groups (p>0.05).

DISCUSSION

According to the results of our study, the frequency of GTPS was found to be 59.2% in patients who applied to PRM outpatient clinics with CLBP. The presence of GTPS increased the pain level and worsened the functional status. The female gender was found to be a risk factor. About the clinical assessment, gait disturbance and neurogenic claudication were found to be statistically common. Osteophytes, sclerosis, loss of intervertebral disc space, and central spinal stenosis were common imaging features. When compared with the literature, the frequency in our study was found to be similar to studies conducted in spine

TABLE 3: Qualitative demographic, clinical and radiological characteristics.

		CLBP (n=40)		GTPS+CLBP (n=58)		p value
Gender	Female	26	34.7%	49	65.3%	X^2=5.003
	Male	14	60.9%	9	39.1%	p=0.024
Education	No education	2	16.7%	6	83.3%	
	Primary school	13	33.3%	26	66.7%	X^2=3.859
	High school	11	50%	11	50%	p=0.425
	University	14	48.3%	15	51.7%	
Occupation	None	19	33.3%	38	66.7%	X^2=6.206
	Body	6	35.3%	11	64.7%	p=0.146
	Office worker	15	62.5%	9	37.5%	
Comorbid diseases	None	28	43.8%	36	56.3%	X^2=2.268
	One	11	40.7%	16	59.3%	p=0.322
	More than one	1	14.3%	6	85.7%	
Smoking	-	29	39.7%	44	60.3%	X^2=0.141
	+	11	44%	14	56%	p=0.44
Pain radiation	Centralized to low back	19	73.1%	7	26.9%	
	Low back and radiation to hip	12	23.1%	40	76.9%	X^2=18.144
	Low back and radiation to knee	1	50%	1	50%	p=0.001
	Low back and radiation to foot	8	44.4%	10	55.6%	
Neurogenic claudication	-	34	47.0%	37	52.1%	X^2=5.334
	+	6	22.2%	21	77.8%	p=0.017
Gait disturbance	-	39	44.8%	48	55.2%	X^2=5.163
	+	1	9.1%	10	90.9%	p=0.021
x-Ray osteophyte	-	19	57.6%	14	42.4%	X^2=7.712
	+	21	31.3%	44	68.8%	p=0.021
x-Ray-decreased intervertebral disc distance	-	11	61.1%	7	38.9%	X^2=3.602
	+	29	36.7%	50	63.3%	p=0.05
x-Ray-sclerosis	-	24	54.5%	20	45.5%	X^2=6.231
	+	16	29.6%	38	70.4%	p=0.011
MRI-disc degeneration	-	3	37.5%	5	62.5%	X^2=0.4
	+	37	41.1%	53	58.9%	p=0.577
MRI-Modic changes	-	30	41.1%	43	58.9%	X^2=0.009
	+	10	40%	15	60%	p=0.588
MRI-disc herniation	-	1	33.3%	2	66.7%	X^2=0.072
	+	39	41.1%	56	58.9%	p=0.638
MRI-spinal canal stenosis	-	39	44.8%	48	55.2%	X^2=5.163
	+	1	10%	10	90%	p=0.021
MRI-lateral canal stenosis	-	30	44.8%	37	55.2%	X^2=1.375
	+	10	32.3%	21	67.7%	p=0.171
MRI-faset joint hypertrophy	-	29	46.8%	33	53.2%	X^2=2.48
	+	11	30.6%	25	69.4%	p=0.086

CLBP: Chronic low back pain; GTPS: Greater trochanteric pain syndrome; MRI: Magnetic resonance imaging.

clinics. In the study by Tan et al., 50.5% of the patients who applied to the spine center had GTPS.[7] According to studies, the diagnosis of GTPS is often missed.[7,8] We found the same findings as well in our study. None of the patients stated that they had been diagnosed with this syndrome before and they did not receive any treatment.

Regarding the clinical risk factors; the female gender was found to be a risk factor in our study. Female gender was also determined as a risk factor in other studies.[7] The difference in biomechanics, the more symptomatic course of osteoarthritis, and high rate of widespread pain in women may be the reasons for the gender-related difference. Although the age

difference between the groups was remarkable, it did not reach statistical significance.

Our study showed that the patients with GTPS have additional common clinical findings. The CLBP tended to radiate to the hip, patients described more neurogenic claudication, and gait abnormalities were seen frequently. These findings, suggested that in patients with these clinical findings the clinician should suspect GTPS. Our study, mostly consisted of patients with degenerative disc disease. Using patients with degenerative disc disease as the control group resulted in no significant difference between the groups in MRI evaluation. However, central spinal stenosis was observed more frequently in GTPS patients. On the other hand, the presence of osteophytes, loss of intervertebral disc distance, and increase in sclerosis were higher in the GTPS group in direct radiographic evaluation. It can be said that this situation may be related to the increase in the severity of degenerative disc disease. However, it should not be forgotten that there is an average age difference of 3.5 years between the groups, although it is not statistically significant. When we commented radiological and clinical findings together; our study population had commonly degenerative disc disease, and spinal stenosis. The patients who had severe degenerative disc disease and spinal stenosis tend to have GTPS and these patients had more pain referred to hips, gait abnormalities and neurogenic cladication.

GTPS was found to be a condition that increases pain and decreases the quality of life in the patient population with CLBP. ODI and SF-36 pain sub-parameter scores were worsened in presence of GTPS. Other SF-36 subparameters were similar between groups. These findings suggested with the treatment of GTPS the possible healing effect can be seen on ODI and pain-related parameters.

An interesting study from the United Kingdom showed that GTPS limits the activities of the patients, the pain continues during rest because of lying on the hip, and the patients do not have enough information about this disease. It has been emphasized that patients are pessimistic about improving their condition.[17]

The treatment effect of GTPS in patients with CLBP is not well studied. Local corticosteroid injections are the most popular method in the conservative treatment of GTPS. In addition, relative rest and medical therapy are used for pain control. Since inflammation is not the main problem, non-steroidal anti-inflammatory drugs are used for their analgesic effectiveness. Repetitive damaging activities on the hip should be avoided. For this purpose, lying on the aching side should be prevented and hip abductors should be strengthened. It is recommended to add stretching piriformis muscle and iliotibial band and wall squatting and gluteal muscle strengthening exercises in physical therapy programs.[6] If lumbar, hip, and knee diseases accompany GTPS, it will be beneficial to treat them. The aim of our study was not about to treatment. It can be hypothesized that there may be an increase in the quality of life of the patients when GTPS is treated. Further studies about optimal treatment options are needed.

Our study has advantages as well as limitations. The number of patients was sufficient for statistics. Clinical and imaging findings were evaluated by investigators blinded to each other. In our study, MRI was not routinely requested in order to avoid additional costs. However, the fact that all patients had “at least one” MRI enriched our study. On the other hand, the fact that MRIs were taken in different centers was one of the limitations. Another situation that leads both advantages and limitations was the exclusion of patients with vertebral fractures from the study. This choice was made because osteoporotic vertebral fracture, which is common in this age group, can affect the results as a confounding factor. If these patients were included in the study, we think that the frequency would increase even more. The study contributes to the literature by providing information about radiological and clinical predictors of GTPS in patients with CLBP and also about features of the functional limitation.

CONCLUSION

GTPS was a very common and painful condition in patients with CLBP. It was seen more frequently in women, in patients with a more severe degenerative condition and with central spinal stenosis. GTPS increases the level of pain and negatively affects the quality of life.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

REFERENCES

1. Wong CK, Mak RY, Kwok TS, et al. Prevalence, incidence, and factors associated with non-specific chronic low back pain in community-dwelling older adults aged 60 years and older: a systematic review and meta-analysis. J Pain. 2022;23:509-34. [Crossref] [PubMed]
2. Meroni R, Piscitelli D, Ravasio C, et al. Evidence for managing chronic low back pain in primary care: a review of recommendations from high-quality clinical practice guidelines. Disabil Rehabil. 2021;43:1029-43. [Crossref] [PubMed]
3. Ho GW, Howard TM. Greater trochanteric pain syndrome: more than bursitis and iliotibial tract friction. Curr Sports Med Rep. 2012;11:232-8. [Crossref] [PubMed]
4. Blankenbaker DG, Ullrick SR, Davis KW, et al. Correlation of MRI findings with clinical findings of trochanteric pain syndrome. Skeletal Radiol. 2008;37:903-9. [Crossref] [PubMed]
5. Long SS, Surrey DE, Nazarian LN. Sonography of greater trochanteric pain syndrome and the rarity of primary bursitis. AJR Am J Roentgenol. 2013;201:1083-6. [Crossref] [PubMed]
6. Mallow M, Nazarian LN. Greater trochanteric pain syndrome diagnosis and treatment. Phys Med Rehabil Clin N Am. 2014;25:279-89. [Crossref] [PubMed]
7. Tan LA, Benkli B, Tuchman A, et al. High prevalence of greater trochanteric pain syndrome among patients presenting to spine clinic for evaluation of degenerative lumbar pathologies. J Clin Neurosci. 2018;53:89-91. [Crossref] [PubMed]
8. Tortolani PJ, Carbone JJ, Quartararo LG. Greater trochanteric pain syndrome in patients referred to orthopedic spine specialists. Spine J. 2002;2:251-4. [Crossref] [PubMed]
9. Collée G, Dijkmans BA, Vandenbroucke JP, et al. A clinical epidemiological study in low back pain. Description of two clinical syndromes. Br J Rheumatol. 1990;29:354-7. [Crossref] [PubMed]
10. Pozzi G, Lanza E, Parra CG, et al. Incidence of greater trochanteric pain syndrome in patients suspected for femoroacetabular impingement evaluated using magnetic resonance arthrography of the hip. Radiol Med. 2017;122:208-14. [Crossref] [PubMed]
11. Genth B, Von Düring M, Von Engelhardt LV, et al. Analysis of the sensory innervations of the greater trochanter for improving the treatment of greater trochanteric pain syndrome. Clin Anat. 2012;25:1080-6. [Crossref] [PubMed]
12. Williams BS, Cohen SP. Greater trochanteric pain syndrome: a review of anatomy, diagnosis and treatment. Anesth Analg. 2009;108:1662-70. [Crossref] [PubMed]
13. Barratt PA, Brookes N, Newson A. Conservative treatments for greater trochanteric pain syndrome: a systematic review. Br J Sports Med. 2017;51:97-104. [Crossref] [PubMed]
14. Fairbank JC, Pynsent PB. The Oswestry Disability Index. Spine (Phila Pa 1976). 2000;25:2940-52; discussion 2952. [Crossref] [PubMed]
15. Yakut E, Düger T, Oksüz C, et al. Validation of the Turkish version of the Oswestry Disability Index for patients with low back pain. Spine (Phila Pa 1976). 2004;29:581-5; discussion 585. [Crossref] [PubMed]
16. Koçyiğit H, Aydemir Ö, Fişek G, et al. [Reliability and validity of the Turkish Version of Short Form-36 (SF-36)]. İlaç ve Tedavi Dergisi. 1999;12:102-6. [Link]
17. Stephens G, O'Neill S, Mottershead C, et al. "It's just like a needle going into my hip, basically all of the time". The experiences and perceptions of patients with Greater Trochanteric Pain syndrome in the UK National Health Service. Musculoskelet Sci Pract. 2020;47:102175. [Crossref] [PubMed]